CHAPTER 13

AVIATION FUELS

Section I. Description of Fuels

JET OR TURBINE FUELS

Jet turbine fuels used in turbine-engine-powered Army aircraft have an API gravity range of 36° to 57°API and a boiling range of approximately 100° to 600°F. The types of jet fuels used in Army aircraft are JP-4 (wide-cut gasoline type) and JP-5/JP-8 (kerosene type). JP-8 is mainly used in Army and Air Force aircraft. JP-5 is used by the Navy. Commercial jet fuel procured locally under federal specification follow these guidelines. Navy activities are authorized to use JP-5 in Army turbine-engine-powered aircraft that they base on naval vessels if specified engine adjustments are made.

JET FUEL ADDITIVES

DOD-procured JP-4/8 contains the additive FSII. It also contains an SDA and CI at concentration recommended by vendor on QPL 25017. However, for application of lubricity improvement only, a concentration of 250 PPM (1 quart/1000 gallons) will be used.

FSII

FSII prevents the water in fuel from freezing at normal water-freezing temperatures. Two types of FSII are approved for inhibiting turbine fuels. EGME is required for turbine fuels other than JP-5. DIEGME has been specified for use with JP-5 to protect the flash point. Frozen water particles that collect on the filter screens can cause fuel starvation. This leads to engine failure. When using FSII as an additive to JP-4, the use limit is 0.08 percent minimum FSII by volume. When used for JP-5, the use limit is 0.10 percent minimum FSII by volume. This percent of FSII lowers the freezing point of any dissolved water in the fuel to the freezing point of the fuel itself. If the FSII content of the fuel decreases, the icing protection also decreases. If JP-4/8 contains less than 0.08 percent FSII by volume or less than 0.10 for JP-5, blend it to use limits as soon as possible. This can be done by blending existing stocks, by locally injecting FSII during intraterminal transfer, or by resupply. If the mission prohibits the possibility of blending or inhibiting low FSII stock, permission for limited use of stocks containing 0.08 to 0.20 percent FSII by volume can be obtained by contacting the United States Army Petroleum Center through appropriate command channels.

SDA

SDA increases the fuel's conductivity thereby permitting rapid depletion of any static charge generated during movement. This additive is usually injected by personnel at the supporting DFSP located closest to the using activity. When properly injected, JP-4 will have a conductivity level between 150 and 600 CU. (This is also referred to as the pS/M. The accepted use limits permit issue of fuel with conductivity levels of 100 to 700 CU. A CU level below 100 increases the hazard for explosion; a CU level above 700 adversely affects fuel probes on board aircraft. Blending or injection may be necessary to obtain the required level.

CI

CI in fuel attaches itself to metal surfaces such as the interior of a pipeline. It reduces the effects of water and particulate contamination from corroding the interior surface of the pipeline. CI is the most significant component to JP-8 that provides lubricity to fuel wetted parts in reciprocating engines.

WARNING
Should it become necessary to inject either FSII, SDA, or CI, exercise extreme caution. Both of these additives, in the neat form, are extremely dangerous and can cause serious health problems, both near- and long-term.

AVGAS

Aviation gasolines are hydrocarbon mixtures with an API gravity range of 63° to 75° API and a boiling range of 80° to 340°F. Aviation gasolines are used to power reciprocating-engine aircraft. AVGAS is available in three grades—80/87, 100/130, and 115/145. AVGAS permits high compression, supercharged engines to develop maximum power without preignition (knocking). The Army requirements for AVGAS are decreasing and will be eliminated as reciprocating-engine aircraft are phased out of the Army inventory. Detailed guidance on specification requirements for AVGAS is included in Military Specification MIL-G-5572F.

Section II. Quality Surveillance

REQUIREMENTS

The quality and cleanliness of turbine fuel are vital to the safety of turbine-engine-powered aircraft. Turbine engines have more stringent fuel cleanliness requirements than do reciprocating engines. Because turbine engines have high fuel consumption rates, contaminants accumulate in them rapidly. Fine sediment in the fuel may block the engine fuel supply system and erode critical parts in the engine and fuel control systems. Free water (water not dissolved in the fuel) may freeze at high altitudes and plug the fuel screens. This causes the engine to flame out and possible loss of aircraft. Saltwater is extremely dangerous because of its potential effect on certain aircraft instruments. Turbine-engine-powered aircraft must have high-pressure, complex metering equipment to measure fuel precisely over a wide range of altitudes, speeds, and powers. Also, contaminants must be separated out of turbine fuel before the fuel can be pumped into the aircraft. Turbine engine filters cannot remove fine sediment, excessive amounts of sediment, or water from the fuel. Separating the contaminants from JP-5 and JP-8 is time consuming and further complicated by their high viscosity and specific gravity.

RESPONSIBILITY

Any unit or organization that has military owned aviation fuel in its physical possession is responsible for setting up and maintaining an adequate quality surveillance program. Each person involved in aircraft refueling is responsible for ensuring that the fuel pumped into an aircraft is clean, bright, and on specification and that it does not contain any free water or sediment.

AUTHORIZED PERSONNEL

Sampling and testing of petroleum products must be done by trained personnel. Personnel requirements are described below.

- Sampling. No person must be permitted to draw an aviation fuel sample unless he is thoroughly familiar with and can satisfactorily perform all required sampling as outlined in Chapter 3**.** The importance of good sampling techniques cannot be overemphasized. If a sample submitted for testing does not truly represent the sampled product, the value of the test is lost.

- Testing. All petroleum testing must be done by trained personnel. Only trained personnel may teach operators to perform API gravity, Aqua-Glo, and particulate contaminates by color indicator method tests on fuel owned by their units. (The color indicator test for particulate contamination is designed to be part of the preflight checks for aviation fuels. This is not a substitute for monthly laboratory filter effectiveness testing.) Do not let untrained personnel conduct these tests. Trained personnel are available to make liaison visits and to give technical help to units they support. Units that handle aviation fuels should use this technical expertise and help.

COMMON CONTAMINATION HAZARDS

Quality surveillance testing and sampling are used to find common contamination hazards. The hazards that affect aircraft are sediment, water, microbiological growth, and commingled fuel.

Sediment

Sediment from tanks, pipes, hoses, pumps, people, and the air contaminates fuel. The most common sediments found in aviation fuels are pieces of rust, paint, metal, rubber, dust, and sand. Sediment is classified by particle size.

- Coarse sediment. Particles classified as coarse are 10 microns in size or larger (25,400 microns equal 1 inch). Coarse sediment settles out of fuel easily, and it can also be removed by adequate filtering. Particles of coarse sediment clog nozzle screens, other fine screens throughout the aircraft fuel system, and most dangerously, the fuel orifices of aircraft engines. Particles of this size also become wedged in sliding valve clearances and valve shoulders where they cause excessive wear in the fuel controls and fuel injection equipment.

- Fine sediment. Particles classified as fine are smaller than 10 microns in size. Removing fine sediment by settling or filtering is effective only to a limited degree. Fine sediment accumulates in fuel controls and forms a dark, shellac-like surface on the sliding valves. It can also form a sludge like material that causes fuel injection equipment to operate sluggishly. Particles of fine sediment are not visible to the naked eye, but they do scatter light. This light-scattering property makes them show up as point flashes of light or as a slight haze in the fuel.

Water

Either fresh or saltwater may be in fuel. Water (fresh or salt) may be present as dissolved or free water.

- Free water. Free water can be removed from fuel by adequate filtering. It can be seen in the fuel as a cloud, emulsion, droplets, or in large amounts at the bottom of a tank, sample container, or filter/separator. Free water can freeze in the aircraft fuel system, can make certain aircraft instruments malfunction, and can corrode the components of the aircraft fuel system. Saltwater is more corrosive than fresh water. Ice in an aircraft fuel system can make the engines fail.

- Dissolved water. Dissolved water is water that has been absorbed by the fuel. It cannot be seen and cannot be separated out of the fuel by filtration or mechanical means. The danger of dissolved water is that it settles out as free water when the fuel is cooled to a temperature lower than that at which the water is dissolved. Such a cooling of fuel is likely at high altitudes. Once freed, all the dangers of free water are present.

Microbiological Growth

If there is no water in the fuel, microbes cannot grow. Microbiological growth is brown, black, or gray and looks stringy or fibrous. It causes problems because these organisms hold rust and water in suspension and act as stabilizing agents for water-fuel emulsions. These suspensions cling to glass and metal and can cause false fuel quantity readings. They also make fuel controls operate sluggishly and make fuel flow dividers stick. Microbiological growth in aircraft fuel is a reliable indication that the fuel filters have failed, that the water has not been properly stripped from the fuel, or that the fuel storage tanks need to be cleaned more frequently. Addition of FSII to JP-4 has helped curb microbiological growth. However, it is still necessary to remove all water from aviation fuel and aircraft fuel systems.

Commingled Fuel

Since each aircraft engine is designed to burn one particular type and grade of fuel, the consequences of using a mixture of different fuels can range from small variations in engine performance to total loss of power and engine failure. The consequences of commingling depend on the physical properties of the fuel.

FILTER/SEPARATORS

Filter/separators help to keep fuel clean and free from water. When fuel is left in the dispensing hose at the end of the day's operation, it should be recirculated through the filter/separator before operations resume. Filter/separators must qualify under Military Specification MIL-F-8901E. The capacity of the unit must suit the capacity of the pump. Follow the steps described below to keep filter/separators in good condition.

- Step 1. Check the filter/separator sumps each day, and drain any water. Sample any fuel-water mixture in a clean glass jar and check for water. Then dispose of the sample in an approved fuel container. Further disposition should be IAW local regulations.
- Step 2. Check the accuracy of the pressure differential indicator or gage annually. The appropriate intermediate DS, intermediate GS, unit maintenance, or directorate of logistics personnel must perform this check. Keep a record of this check either by marking the indicator or gage or by keeping a logbook.
- Step 3. Keep a daily record of pressure differential readings. With new clean filter elements, the pressure differential is usually 2.5 PSI or less. It should increase slowly and gradually.
- Step 4. Inspect the elements immediately when there is a sudden drop in the pressure differential. An element may have ruptured. If there is no sign of rupture, submit a fuel sample to the laboratory to test the filter's effectiveness.
- Step 5. Check new filter elements if there is no increase in the pressure differential after several months of operation. The elements may not be properly installed, or some may be ruptured.
- Step 6. Change the filter elements at once when the reading on the pressure differential indicator is red (35 PSI and up). Change them at the end of the daily operation when the reading is in the yellow (20-35 PSI). After installing new filter elements, they should be checked for effectiveness by the supporting petroleum laboratory.
- Step 7. Change the filter elements at least every 24 months or at the time interval specified by the manufacturer. Also change the elements when laboratory tests show excessive sediment or water.
- Step 8. Test all filter/separators for filter effectiveness every 30 days by having a product sample tested at a certified laboratory.
- Step 9. Change the elements immediately if the pressure differential exceeds the limits listed in the appropriate TM for a refueling vehicle.
- Step 10. Mark the filter/separator housing with the date when the filter elements were first put into use or when the filter elements were last changed.

SAMPLING AND TESTING FREQUENCY

How often aviation fuels are sampled and tested depends on several factors. It depends upon whether the fuel is taken from a fuel source, a system or refueler, or an aircraft tank.

Fuel from Fuel Sources

Identify aviation fuels before they are used to fuel aircraft. Each fuel source must be sampled, identified by visual check of the color and appearance, and then classified by the API gravity test (Appendix I). Run Aqua-Glo and particulate contaminant tests on the fuel during the filling of each aviation fuel source. Sampling and testing will be performed by the supplying unit. Fuel used at a forward area refueling point must be sampled, tested, and classified. Plainly mark the aviation fuel source (collapsible drum, tank vehicle) before delivery to the forward area. If the fuel for a forward area refueling point moves through the parent unit, the parent unit must classify it. If the fuel is delivered directly by a CSS unit, the delivering unit must classify the fuel before delivering it.

Fuel in a System or Refueler

Sample and test the fuel in a system or refueler daily for water at the start of aircraft refueling operations and again when changing the filter elements of the filter/separator on the system or refueler. Perform this test with the Aqua-Glo kit. The Aqua-Glo test must be made on a moving stream of fuel. Test refuelers during the daily preoperational recirculation of fuel. Sample the fuel in a system when the pump is operating and at least one nozzle is

open. This sampling and testing should be performed on FARE system by the parent unit before the FARE is deployed to a forward area.

Fuel in Aircraft Tanks

A visual check of the fuel in aircraft tanks must be made by the flight crew before the first flight of each working day. The pilot or crew chief must draw a sample from each tank as part of preflight procedures. The sample must be taken after the fuel tank sumps have been drained. The sample must be drawn in a clean, clear glass container. The size of the sample may vary between ½ and 1 pint depending on the condition of the fuel. If contamination shows in the sample, more fuel should be drawn. If water, sediment, or any other suspicious matter is visible in the fuel after 1 quart or more is drawn, the supervisor should be consulted for instructions.

LABORATORY TESTING

Laboratory testing ensures that the fuel's quality meets specifications; that unknown products are identified; that existing or potential contamination causes are identified. It also ensures that unfavorable field test results are corroborated and that off-specification fuels are not used. Each using agency, installation, and unit submits petroleum samples to its supporting laboratory for testing by qualified technicians (Appendix C-14 of AR 710-2). Submit these samples IAW MIL-HDBK-200 and as follows:

•When requested by petroleum offices.

•When fuel quality is questionable.

•When local classification is not possible or needs corroboration.

•When a filter/separator is first placed in service, after changing the filter elements,

and every month thereafter.

•After any aircraft crash in which the engine failed or engine failure is suspected.

PREFLIGHT SAMPLING AND TESTING

Certain minimum requirements for testing at the unit/organization level must be carried out before refueling aircraft and before flight. The scope of the testing is restricted by the availability of testing equipment suitable for use in field situations and by the short time frame in which test results must be obtained. This testing identifies the most common forms of aircraft fuel contamination. These are commingling, particulate matter, and water.

Testing Fuel From Fuel Source

Fuel supplies must be tested to confirm their identities (API gravity test) to detect water (Aqua-Glo test) and to detect particulate contaminates by color comparator ratings. The aviation fuel contamination test kit is designed to provide a final check on aviation fuel just before fueling of an aircraft. It includes the API gravity test, the Aqua-Glo test, and the Millipore test (a test for particulate contaminates). The kit, used primarily by aviation companies, is operated by the fuel truck operator.

•Fuel classification (API gravity test*).* Each type and grade of fuel has a particular API gravity range. The API gravity test shows whether a fuel is actually what it is supposed to be. It is used hand in hand with visual examination. A visual check differentiates fuels by color: JP-4, JP-5, and JP-8 are clear to amber; combat MOGAS is red; and AVGAS, grade 100/130, is green. The API gravity test confirms the color identification. This test is necessary because the dyes used in fuels may lose color with age or when subjected to heat. The API gravity test is a measure of the average specific gravity or weight of the hydrocarbons (molecules) present. Appendix I includes the API gravity ranges of common military fuels, an equipment list, and the procedures required to conduct the API gravity test.

•Water detection (Aqua-Glo test). The presence of water in a fuel is tested with the automotive/aviation fuel water detector kit, commonly called the Aqua-Glo kit. Aviation fuels may not be used if they contain more than 10 PPM of water. The Aqua-Glo water detection test checks to see that the filter/separator is working properly. If a reading is below the maximum allowable amount (10 PPM), the fuel is within the limits prescribed by military specification. If the test shows more than 10 PPM of water in the sample, the fuel is off specification. This shows that the filter/separator failed or that there is a malfunction in the system. The fuel and the system or refueler

pumping it should be removed from service immediately for further examination. The fuel must be segregated and sampled. The sample is sent to the supporting laboratory for all tests called for by its specification. The equipment must be inspected to see if any source of water is present. The filter/separator must be opened and its filter elements removed and replaced. Before the system or refueler may be placed back in service, it must be retested to be sure that the water content of the fuel is below the maximum reading. Appendix E includes the equipment and procedures required to conduct the Aqua-Glo test.

- Fibrous material. Samples of fuel that are to be dispensed to aircraft should contain no more than 10 fibers when a 1-quart sample is visually examined. When more than 10 fibers can be seen, the filter or filter/separator elements are not functioning properly. Corrective action should be taken.

- Filter membrane color ratings. Filter membrane color ratings are used to determine the quality of aviation turbine fuels (its particulate contamination). Appendix G discusses the use and procedures of this test. Another method of determining particulate contaminant is ASTM D 2276.

Testing Fuel in Aircraft Tanks

Fuel in aircraft tanks must be checked by the aircraft crew before flight operations begin. Taking a preflight sample is the only way to ensure that the fuel on board does not contain water or other visible contaminants. (The sample must be taken after the fuel tank sumps have been drained. Check for contamination by taking a sample from fuel sumps and filters IAW the operator's manual.) Although visual checks safeguard against and warn of contamination, they do not ensure that the checked product meets all requirements of its specification. When a visual check shows that the fuel may be contaminated, the aircraft should not be permitted to fly and the fuel sample should be sent to the supporting laboratory for testing. Any remaining fuel in storage should be isolated and not used until test reports are received. Any fuel that fails a visual check should be segregated and held until laboratory test results are received. To visually check a fuel, draw a sample in a clean sample bottle and look for the items described below.

- Color. The color of an aviation fuel depends on its type and grade. Leaded fuels must be dyed, so AVGAS is dyed differently for different grades. Grade 100/130 is dyed green and grade 80/87 is dyed red. Jet fuels, because they are unleaded, are not dyed. They may be any color from water white to amber. Proper color shows freshness and uniformity, but not necessarily quality. An off color or color of the wrong intensity does not always mean that the fuel is off specification; however, it does mean to look for contamination signs.

- Cleanliness and brightness. The fuel should be clean and bright. Cleanliness and brightness are distinct from fuel color. Clean means without visible sediment, cloud, haze, emulsion, or free water. Bright means having the characteristic sparkle of clean, dry fuel in transmitted light.

- Cloud or haze. Ordinarily, a cloud or haze in fuel shows the presence of water, but cloudiness can be caused by large amounts of fine sediment. Cloudy fuel is not acceptable for use in aircraft. When a clean, bright fuel cools, a light cloud may form. Such a cloud shows that dissolved water has separated into a very small amount of free water. Since free water is not acceptable in aviation fuels, the fuel should be rejected. If a cloud is present in a fuel after it has been passed through a filter/separator system, the filter elements in the filter/separator should be replaced. Also, the source tank should be stripped of both water and emulsion. Cloudy fuel should be recirculated through fresh filter elements. A precipitation cloud can be removed by a filter/separator that is working properly.

- Sediment. To be visible to the naked eye as specks, sediment particles must be larger than 40 microns. Visible sediment particles in a sample show that the filter/separator is not working properly; that there is a source of contamination downstream of the filter/separator; or that the sample container was not cleaned properly. In a sample of clean fuel, no sediment should be visible. However, even with the most efficient filter/separator and careful fuel handling, occasionally there will be visible sediment particles in fuel. This sediment will normally be in the form of an extremely fine powder, rouge, or silt.

- Water. Entrained water may appear as a cloud or haze and it may settle out. Free water may be visible as droplets or at the bottom of the sample container. If any free or entrained water is present, the fuel is unacceptable.

- Fibrous material. A quart sample of acceptable aviation fuel should not contain more than 10 fibers MIL-HDBK-200). The presence of more than 10 fibers per quart indicates that the filter/separator from the servicing

vehicle is not working properly or that the filter elements are breaking down. The fibers can be detected visually, but a specific count can be determined only by laboratory testing.

SAMPLING AFTER AIRCRAFT ACCIDENTS/INCIDENTS

Fuel samples are taken after aircraft mishaps by an accident investigating team appointed by the proper authority. See DA Pamphlet 385-40. Investigation of Class A through E accidents/incidents is required as part of the aircraft accident prevention program. When an aircraft accident occurs in CONUS, the TAV representative at the responsible petroleum field office should be informed. Combat losses are not considered accidents. Therefore, the sampling requirements described below do not apply to incidents classified as combat losses.

Sampling From Aircraft

Fuel and lubricant samples should be taken from the aircraft as soon as possible after the incident. Take the samples as follows:

- Use the sampling kit assembled for this purpose.
- Draw a 4-ounce sample of fuel from the aircraft tank. If the aircraft has tanks that do not flow into each other, take a sample from each tank. Check the sample for color, visible water, sediment, and contaminants.
- Draw a 2-gallon sample if the aircraft used jet fuel (clear to amber). If the aircraft used AVGAS (green or light blue), draw a 5-gallon sample. Draw 1 gallon of lubricating oil from the aircraft.
- Close all sample containers tightly and tag each with a DA Form 1804. Fill in the sample tag to provide complete identifying information including type of product, where the sample was taken, why the sample was taken, name of person who took the sample, date the sample was taken, aircraft identification number, and any other useful information. More details of sampling and tagging procedures are found in FM 10-67-2.
- Forward these samples to the appropriate petroleum laboratory (Appendix C-14 of AR 710-2).

Sampling From Fuel Sources

Retrace the fuel records of the aircraft. Obtain information and collect the samples as follows:

- Record the date of the last refueling before the incident; the system or number of the refueler (tank vehicle); and the name of the unit, organization, or supplier of the last refueling service. Check the results of the filter efficiency and Aqua-Glo tests of the refueler. Also check the records of the daily filter pressure differential readings.
- Contact the organization that provided the last refueling. Record the date that the applicable refueler, tank, or drum was filled and the bulk storage system from which it was filled.
- Contact the organization responsible for the bulk storage system. Record the date the fuel was received into the storage system and the supplier of the fuel. Check the bulk storage test results. If the fuel in storage has not been tested for 90 days, it should be retested. The storage tank records should show the daily water bottom checks and test results when products were received.
- Draw a sample (2 gallons of JP-4, JP-5, or JP-8; 5 gallons of AVGAS) from the refueler, tank, or drum that was used to refuel the aircraft. Draw a sample from the bulk storage system from which the refueler, tank, or drum was filled.
- Close the samples tightly. Tag each with the required information, and forward all samples to the appropriate petroleum laboratory for analysis.

Sampling Kit

The sampling kit is needed to take fuel samples from downed aircraft. It should be kept in a suitable container to protect it and to aid transport to and from the crash site. The kit includes the following:

- Eight 1-gallon sample cans (packed two to a shipping container).
- Sample tags, shipping tags, and labels.
- Vacuum pump thief which is a local purchase item.
- Two clear, 4-ounce sample bottles to use for visual checks.

- Clean rags.
- Sample stoppers.
- One 10-foot, 1/8-inch-diameter bonding cable with connector clips.
- Other tools such as wrenches, screwdrivers. and a hammer.
- Placard that has sampling and shipping instructions for samples taken.

Aviation Fuel Contamination Kit

The purpose of the aviation fuel contamination kit is to provide a capability to perform daily checks prior to dispensing and monthly checks for filter effectiveness. It has the capability to perform type C testing, Aqua-Glo test, and matched weight monitors for particulate contamination. The kit can be operated by an aviation fuel handler, but the matched weight monitors must be sent to a petroleum laboratory.

SAMPLE FUEL DISPOSAL

Fuel samples should be disposed of in an approved fuel container. At permanent installations, the local defense property disposal office disposes of contaminated fuels that are not suitable for use.

OFF-SPECIFICATION PRODUCTS

When a petroleum product is tested, it may be classified in one of three ways. The product may meet military specification it may meet deterioration limits as specified in MIL-HDBK-200, or it may be off specification.

- Disposal. If a petroleum product does not meet the criteria established in its military specification or its deterioration limits, the supporting laboratory notifies the activity that it has the product. Also notify one of the following:
  - USAPC Petroleum Field Office (East). The states east of the Mississippi River are served by the Chief, United States Army Petroleum Center, Petroleum Field Office East, ATTN: SATPC-QE, 54 M Avenue, Suite 9, New Cumberland Army Depot, New Cumberland, PA 17070-5008.
  - USAPC Petroleum Field Office (West). The states west of the Mississippi River are served by the Chief, United States Army Petroleum Center, Petroleum Field Office West, ATTN: SATPC-QW, Building 247, Defense Depot Tracy, Tracy, CA 95371-5000.
  - Defense Fuel Supply Center. Overseas, the appropriate DFSC regional office should be contacted through command channels. DFSC areas of responsibility are in AR 710-2. A recommendation on the disposition or reclamation of the product should be included with the notification. The notification should be sent by the quickest and most efficient written means available, such as an immediate message. The holding unit marks the segregated off-specification fuel and does not use it or transfer to DRMO until disposal instructions are received from the appropriate office.

Reclamation

Reclamation either restores the quality of a contaminated or off-specification product so that it will meet its original specification, or it changes the quality so that the product will meet the specification for a lower grade of fuel. Proper reclamation results in purifying, dehydrating, downgrading, or blending the fuel. When USAPC directs reclamation, the work is performed by the supporting petroleum unit which has the necessary equipment. Normally this work is closely supervised by personnel of the supporting petroleum laboratory.

Petroleum Recovery, Recycling, and Disposal

Policy and guidance for the recovery, recycling, and disposal of contaminated petroleum-based products are provided in AR 710-2.